FORM PTO-1390 (REV. 12-2001) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY 'S DOCKET NUMBER: VWP-513-A

U.S. APPLICATION NO. (If known, see 37 CFR 1.5): 10/070066

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP00/07620	05 August 2000	26 August 1999

TITLE OF INVENTION: WIPER BLADE FOR CLEANING A WINDSCREEN OF A VEHICLE

APPLICANT(S) FOR DO/EO/US: Bruno Egner-Walter and Wilhelm Dorr

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [X] This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. [X] The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [X] is attached hereto (required only if not communicated by the International Bureau).
   b. [ ] has been communicated by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [X] An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. [X] is attached hereto.
   b. [ ] has been previously submitted under 35 U.S.C. 154(d)(4).
7. [ ] Amendments to the claims of the International Aplication under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are attached hereto (required only if not communicated by the International Bureau).
   b. [ ] have been communicated by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [ ] have not been made and will not be made.
8. [ ] An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. [X] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. [ ] An English lanugage translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. [X] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [X] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [X] A FIRST preliminary amendment.
14. [ ] A SECOND or SUBSEQUENT preliminary amendment.
15. [X] A substitute specification.
16. [ ] A change of power of attorney and/or address letter.
17. [ ] A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. [ ] A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. [ ] A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. [X] Other items or information: Red-Lined Specification

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
10/070066	PCT/EP00/07620	VWP-513-A

21. ☒ The following fees are submitted:	CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO **$1040.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **$890.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO **$740.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) **$710.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) **$100.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 890	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$ 0	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	10 - 20 =	0	x **$18.00**	$	
Independent claims	1 - 3 =	0	x **$84.00**	$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$280.00**	$	
TOTAL OF ABOVE CALCULATIONS =				$ 890	
☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.			+	$ 0	
SUBTOTAL =				$ 890	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				$ 0	
TOTAL NATIONAL FEE =				$ 890	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				$ 40	
TOTAL FEES ENCLOSED =				$ 930	
				Amount to be refunded:	$
				charged:	$

a. ☒ A check in the amount of $ 930.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 25-0115. A duplicate copy of this sheet is enclosed.

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

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28422
REGISTRATION NUMBER

Our Reference: WP 0007 (VWP-513-A) PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Bruno Egner-Walter and Wilhelm Dorr
Serial Number:	Unknown
Filing Date:	Concurrent
Examiner/Art Group Unit:	Unknown/Unknown
Title:	WIPER BLADE FOR CLEANING A WINDSCREEN OF A VEHICLE

PRELIMINARY AMENDMENT

Assistant Commissioner of Patents
Washington, D.C. 20231

Sir:

If any charges or fees must be paid in connection with the following communication, they may be paid out of our Deposit Account No. 25-0115.

Prior to initial examination, please amend the above-identified patent application as indicated below.

In the specification:

After the claims, add a new page as follows:

ABSTRACT

A wiper blade for cleaning a windscreen, in particular, a curved windscreen on a vehicle, has a frame with at least two claws to retain and guide a rubber-like wiper element, where the frame has at least one claw bow with a claw on at least one end of the bow and a pivot at a distance from the claw, where the claw has a contact surface at the claw base pressing on the upper side of the wiper element, where the surface is delimited in the longitudinal direction of the bow by an outer edge and an inner edge and has a maximum length and has claw fingers on the opposite longitudinal sides of the wiper element which capture the rear body forming part of the wiper element or engage longitudinal grooves in the side of the rear body and are delimited in the longitudinal direction by an outer edge and an inner edge,

and the contact surface envisages that the claw fingers of at least one claw of the wiper blade are offset in relation to the contact surface in the longitudinal direction of the bow toward the pivot of the claw bow in such a way that the outer edges of the claw fingers are located within an area which extends from inclusive of half the maximum length of the contact surface as far and into the distance between the inner edge of the contact surface and the pivot of the claw bow.

In the claims:

1. (Amended) A wiper blade for cleaning a windshield of a vehicle with a frame, and with at least two claws to hold and guide a rubber-like wiper element, where the frame has at least one claw bow with a claw on at least one end of the bow and the claw bow can be connected at a distance (D) from the claw by means of a pivot to one of a wiper arm and to an additional bow on the frame, where the claw has, at the claw base, a bearing surface which presses on the upper side of the wiper element when the windshield wiper is operating, which surface is delimited in the longitudinal direction of the frame by an outer edge and an inner edge and has a maximum length (L), and where two claw sidewalls which turn into claw fingers extend from the claw base toward the windshield to be wiped running along the opposite longitudinal sides of the wiper element and where the claw fingers capture the rear body forming part of the wiper element from one of below and engage longitudinal side grooves in the rear body, where the claw fingers are bounded in the longitudinal direction of the bow and are each delimited by an outer edge and an inner edge, characterized in that the claw fingers of at least one claw on the windshield wiper are offset in the longitudinal direction in relation to the contact surface toward the pivot of the claw bow in such a way that the outer edges of the claw feet are located within an area which extends from inclusive of half of the maximum length (L) of the contact surface as far as the distance between the inner edge of the contact surface and the pivot of the claw bow.

2. (Amended) The wiper blade in accordance with claim 1, where between the inner edge of the contact surface and the outer edges of the claw fingers a gap d is present with d equal to or less than zero.

3. (Amended) The wiper blade in accordance with claim 1, where, in a side view of the wiper blade, the two claw fingers are aligned with each other.

4. (Amended) The wiper blade in accordance with claim 1 where the claw finger is offset in the longitudinal direction in relation to the claw finger .

5. (Amended) The wiper blade in accordance with claim 4, where the wiper element is curved in plan view and where the distance d1 of one claw finger on the side which lies on the outside of the wiper element curvature is less than the distance d2 on the other claw side which lies on the inside of the wiper element curvature.

6. (Amended) The wiper blade in accordance with claim 5, where the distances d1 and d2 are dependent on the degree of curvature of the wiper element in plan view.

7. (Amended) The wiper blade in accordance with claim 1 where one of the side of the claw base facing the wiper element is curved in relation to the claw fingers and the claw fingers have a convex curve in relation to the claw base.

8. (Amended) The wiper blade in accordance with claim 1, where at least one claw on the claw bow is a windshield wiper end claw.

Add the following new claims:

9. (New) The wiper blade in accordance with claim 1 wherein a side view of the wiper blade, the distance in the case of the two claw fingers is the same.

10. (New) The wiper bade in accordance with 1, where the distance d1 of one claw finger is different from the distance d2 of the other claw fingers.

REMARKS

After entry of this amendment, claims 1-10 are pending in the application. Claims 1-8 have been amended. Claims 9-10 have been added in this amendment.

A handwritten, corrected copy of the specification is enclosed showing the changes which have been made to the specification as required by Section 608.01(Q) and 714.20(1) of the Manual of Patent Examining Procedure. The Substitute Specification filed herewith has been amended to utilize idiomatic English, correct minor typographical and grammatical errors and to conform the application to current United States patent practice. The Substitute Specification includes no new subject matter; but does include the same changes handwritten in red in the attached, corrected, original specification. Entry of the Substitute Specification is respectfully requested.

It is submitted that this Amendment has antecedent basis in the application as originally filed, including the specification, claims and drawings, and that this Amendment does not add any new subject matter to the application. Consideration of the application as amended is requested.

Respectfully submitted,

YOUNG, BASILE, HANLON, MacFARLANE, WOOD & HELMHOLDT, P.C.

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Dated: February 26, 2002
WMH/jao

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the specification:

An abstract is submitted herewith.

In the claims:

1. (Amended) [Wiper] A wiper blade for cleaning a windshield[, in particular, a curved windshield] of a vehicle with a frame, and with at least two claws [(5)] to hold and guide a rubber-like wiper element [(6)], where the frame has at least one claw bow [(4)] with a claw [(5)] on at least one end of the bow and the claw bow [(4)] can be connected at a distance (D) from the claw [(5)] by means of a pivot [(15)] to one of a wiper arm [(1) or is connected] and to an additional bow [(2, 3)] on the frame, where the claw [(5)] has, at the claw base [(8)], a bearing surface [(8a)] which presses on the upper side of the wiper element [(6)] when the windshield wiper is operating, which surface is delimited in the longitudinal direction of the frame by an outer edge [(11a)] and an inner edge [(11b)] and has a maximum length (L), and where two claw sidewalls [(9)] which turn into claw fingers [(10, 13, 14)] extend from the claw base [(8)] toward the windshield to be wiped running along the opposite longitudinal sides of the wiper element [(6)] and where the claw fingers capture the rear body [(6a)] forming part of the wiper element [(6)] from one of below [or]and engage longitudinal side grooves in the rear body [(6)], where the claw fingers [(10, 13, 14)] are bounded in the longitudinal direction of the bow and are each[/both] delimited by an outer edge [(12a)] and an inner edge [(12b)], characterized in that the claw fingers [(10)] of at least one claw [(5)] on the windshield wiper [(2)] are offset in the longitudinal direction in relation to the contact surface [(8a)] toward the pivot [(15)] of the claw bow [(4)] in such a way that the outer edges [(12a)] of the claw feet [(10)] are located within an area which extends from inclusive of half of the maximum length (L) of the contact surface [(8a)] as far as the distance between the inner edge [(11b)] of the contact surface [(8a)] and the pivot [(15)] of the claw bow [(4)].

2. (Amended) [Wiper]The wiper blade in accordance with claim 1, where between the inner edge [(11b)] of the contact surface [(8a)] and the outer edges [(12a)] of the claw fingers [(10, 13, 14)] a gap d is present with d equal to or less than zero.

3. (Amended) [Wiper]The wiper blade in accordance with claim 1 [or 2], where, in a side view of the wiper blade, the two claw fingers [(10)] are aligned with each other [or where the distance d in the case of the two claw fingers (10) is the same].

4. (Amended) [Wiper]The wiper blade in accordance with claim 1[or 2,] where the claw finger [(13)] is offset in the longitudinal direction in relation to the claw finger [(14) or where the distance d1 of one claw finger (13) is different from the distance d2 of the other claw finger (14)].

5. (Amended) [Wiper]The wiper blade in accordance with claim 4, where the wiper element [(6)] is curved in plan view and where the distance d1 of one claw finger [(13)] on the side which lies on the outside of the wiper element curvature is less than the distance d2 on the other claw side [(14)] which lies on the inside of the wiper element curvature.

6. (Amended) [Wiper]The wiper blade in accordance with claim 5, where the distances d1 and d2 are dependent on the degree of curvature of the wiper element [(6)] in plan view.

7. (Amended) [Wiper]The wiper blade in accordance with [one of the preceding claims,] claim 1 where one of the side of the claw base [(8)] facing the wiper element [(6)] is curved in relation to the claw fingers [(10, 13, 14) and/or]and the claw fingers [(10, 13, 14)] have a convex curve in relation to the claw base [(8)].

8. (Amended) [Wiper]The wiper blade in accordance with [one of the preceding claims]claim 1, where at least one claw [(5)] on the claw bow [(4)] is a windshield wiper end claw.

New claims 9 and 10 are submitted herein.

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Wiper Blade For Cleaning A Windscreen, In Particular, A Curved Windscreen Of A Vehicle

BACKGROUND

The invention relates to a wiper blade for cleaning a windshield, in particular a curved windshield of a vehicle with a frame with at least two claws to retain and guide a rubber-like wiper element, where the frame has a least one claw bow with a claw on least one end of the bow and the claw bow can be connected by means of a pivot to a wiper arm at a distance from the claw or is connected to an additional bow on the frame, where the claw has a contact surface at the base of the claw pressing on the upper side of the wiper element when the windshield wiper is operating, and the contact surface is delimited in the longitudinal direction of the frame by an outer edge and an inner edge and has a maximum length, and where two claw sidewalls running along the opposite longitudinal sides of the wiper element extend from the claw base toward the glass to be wiped, which claw sidewalls turn into claw fingers which capture the rear body forming part of the wiper element at the base or engage longitudinal side grooves in the rear body, where the claw fingers are delimited in the longitudinal direction of the frame in each case by an outer edge and an inner edge.

A wiper blade with a claw of this type has been known for a long time, from US 1,197,338, for example, and finds an application in almost every windshield wiper installation used today for cleaning a windshield on a vehicle. The wiper element of a wiper blade of this type is positioned in the claws with at least limited axial freedom so that the flexible wiper element is largely able to conform to the surface shape of the windshield to be wiped. The claws located on a claw bow serve to guide the wiper element along the windshield to be wiped and to transmit the requisite contact pressure to the wiper element, where the glass can also have a contoured shape. When designing claws, one consideration is that they guide the wiper element, or its rear body, as closely and precisely as possible. Nevertheless, the wiper element must have enough play in the claw to allow the wiper element some axial freedom in the claw.

Known wiper blades of this type however are under the disadvantage that they are poorly suited for use on at least partially contoured windshields.

The conflicting goal of ensuring close and precise guidance of the wiper element in the claw on the one hand and of permitting sufficient play in the claw for axial freedom of the wiper element on the other hand when wiping a contoured windshield cannot be met with known wiper blades. When claws for known windshield wipers are used for glass that is steeply contoured, particularly at the edges of the glass, the wiper element either jams because of its curvature or it floats because of excessive play in the claw so that optimal guiding of the wiper element is not ensured. The consequence is unsatisfactory wiping.

The object of the present invention is therefore to create a wiper blade with claws to locate a rubber-like wiper element at least partially, where the claws ensure good guidance and good axial freedom of the rubber-like wiper element in the claws even with a contoured or partially contoured windshield.

SUMMARY

To accomplish this object a wiper blade of the type described above at the beginning is proposed in which the claw fingers of at least one claw on the wiper blade are offset toward the pivot of the bow in the longitudinal direction of the frame in relation to the contact surface in the claw base in such a way that the outer edges of the claw fingers are located within an area which extends from inclusive of the half of the maximum length of the contact surface as far as the distance between the inner edge of the contact surface and the pivot of the bow. In the sense of the invention an outer edge of the contact surface in the claw base or an outer edge of a claw foot is always that edge which faces outward in the longitudinal direction of the frame. Correspondingly, an inner edge of the contact surface in the claw base or an inner edge of a claw finger is always that edge which faces inward in the longitudinal direction of the bow.

Alternatively this state of affairs can be expressed in this way, that in the case of at least one claw on the windshield wiper the claw fingers projected onto the windshield in relation to the contact surface projected onto the windshield are offset in such a way toward the pivot of the claw bow that the claw fingers projected onto the windshield are not overlapped by the bearing surface projected

onto the windshield in the longitudinal direction of the claw bow, or at most by the half of the contact surface facing the pivot projected onto the windshield.

The claw designed under the invention can be used in a wide variety of frame or bow designs. So a claw bow configured according to the invention can, for example, be a primary bow pivotable directly at the wiper arm with a claw at each end, or a claw bow pivoted at a higher order bow with a claw at one end of each, or a bow with a claw at only one end and a claw bow at its other end. Similarly the frame for a windshield wiper can have two bows which are connected to each other at one of their ends by means of a an articulated link and at least one of these bows has at its other end a claw configured in accordance with the invention. The invention is intended further to include wiper blades with such frame or bow designs in which the claw or claws respectively are not located on the underside of the bow, but located or configured, for example, laterally on or laterally from the bow.

Furthermore it should be made clear that wiper blades in accordance with the invention can be used for all possible types of glass, such as windshields, rear windows, side windows, (viewing windows in general), headlamp glass, rear lamp glass, backup lights and similar on different vehicles, specifically motor vehicles.

The wiper blade in accordance with the invention has the advantage that even with more steeply contoured windshields better conformance and guidance of the rubber-like wiper element to the glass to be wiped is ensured compared with known wiper blades. Jamming of the wiper element in the claw, as is regularly the case under the prior art in the case of steeply contoured glass, cannot happen under the invention.

Optimal design of the wiper blade is achieved from a further development of the invention, according to which a clearance d, with d equal to or greater than zero, is present between the inner edge of the contact surface provided on the claw base and the outer edges of the claw fingers.

The relevant cross section for the wiper element is calculated from the width b of the claw and the relevant opening dimension c of the claw for the part of the wiper element received by the claw. The opening dimension c is determined as

the hypotenuse of the triangle with the legs as clearance d and claw depth a. From this it follows that when d is greater than or equal to zero, the opening dimension c is greater than or equal to claw depth a. Consequently, it is ensured that the relevant cross section of the claw for the part of the wiper element received by the claw is always greater than or equal to claw height a under the invention, particularly in the case of contoured glass. As a result of the necessary latitude of the wiper element in the claw, axial freedom of the wiper element is always possible and jamming of the wiper element does not occur, whereby correspondingly good results are achieved when wiping the glass.

In accordance with an advantageous embodiment of the invention, the two claw fingers should be aligned with one another in a side view of the wiper blade, or the distance d should be equal in the case of both claw fingers. This enables consistent guidance and transmission of force from the wiper element to the glass.

In an embodiment of the invention, one claw finger is positioned offset in the longitudinal direction of the bow in relation to the other claw finger, or the distance d1 of one claw finger is different from the distance d2 of the other claw finger. Asymmetry of this kind in the claw can be advantageous, particularly with corresponding windshield and/or wiper blade geometries.

A further development of the invention provides for the wiper element to be curved in plan view and for the distance d1 of the claw finger on the claw sidewall which is on the outside of the curvature of the wiper element to be smaller than the distance d2 on the other side of the claw which lies on the inside of the curvature of the wiper element. A further development of the invention of this type has the particular advantage that not only is optimal conformance of the wiper element to a sharply contoured glass ensured but also that when a wiper blade curved in plan view is used, the claw is configured in such a way that the wiper element is not impeded in its axial freedom by the claw. Wiper blades curved in plan view are used predominantly for stylistic and aesthetic reasons in motor vehicles.

According to another embodiment of the invention, the distances d1 and d2 are dependent on the degree of curvature of the wiper element when seen in plan view. With wiper elements which are only slightly curved, for example, the

difference between the distances d1 and d2 is less than with especially sharply curved wiper elements. In this way optimal axial freedom of the wiper elements can be ensured even in the case of wiper elements that are curved in plan view.

One version of the invention envisions that the side of the claw base facing the wiper element with respect to the claw fingers and/or the claw fingers with respect to the claw base has or have a convex curve. Curvatures of this type make it possible to improve the axial freedom of the wiper element, particularly in the case of windshields with widely differing contours.

A further development of the invention provides for at least one claw on the claw bow to be an end claw for the wiper blade. An end claw is that claw on a wiper blade which is closest to the outer glass edge. Vehicle windshields are mostly more steeply contoured specifically in this area than in the center of the windshield. Consequently it makes sense to use claws in this particular area which ensure optimal guidance and transmission of force from the wiper element to the particularly steeply contoured sections of the windshield.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing,

Figure 1 shows a wiper lever arm assembly for a windshield wiper device in side view,

Figure 2 shows a claw bow for a known wiper blade in side view,

Figures 3 and 4 show two different versions of a claw for a known wiper blade in side view,

Figures 5, 6 and 7 show three different claws for a wiper blade according to the invention in side view, respectively, and

Figure 8 shows the claw shown in Figure 7 in plan view.

DETAILED DESCRIPTION

Figure 1 shows as an example a wiper lever arm 1 from a known windshield wiper installation for cleaning a windshield on a vehicle with a primary bow 2, on which two bows 3 are arranged symmetrically, which in turn are connected to claw bows 4. The claw bows 4 are mounted by means of the pivots 15 so that they can articulate with respect to the bows 3. At their opposite ends the claw bows 4 each have a claw 5 on the side facing away from the primary bow 2. The claws 5 receive the rear body 6a forming part of a rubber-like wiper element 6, which can be

specifically reinforced by spring splines, which are not shown, in longitudinal grooves in the rear body 6a.

Diverging from this type of windshield wiper, the main bow 2 could be configured directly as a claw bow as part of the invention by providing a claw at each of its opposite ends.

Figure 2 shows a claw bow 4 with a pivot 15 at a distance D from at least one of the claws 5, where two known claws 5 are located at the ends of the claw bow 4. These claws 5 receive the rear body 6a forming part of the wiper element 6, which has a wiping edge 7 on the side facing away from the claw bow 4.

Figure 3 shows a section of the claw bow 4 with the pivot 15 and with a claw 5 from a known wiper blade. The claw 5 has a claw base 8, two claw sidewalls 9 positioned on the claw base 8 which guide the longitudinal sides of the wiper element 6 or rear body 6a and claw fingers 10 which partially surround the wiper element 6 or rear body 6a. The claw fingers 10 are mainly parallel to the claw base 8. Between the claw base 8 and the claw finger 10 the height x is shown of that part of the wiper element 6 or of its rear body 6a which is received by the claw 5. The wiper element 6 or rear body 6a is shown slightly curved in the side view, specifically to conform to a contoured windshield which is not shown. The claw 5 has height a between the claw base 9 and the claw finger 10. The basic rule is that the depth x of the part of the windshield wiper blade 6 to be received by the claw 5 must be less than claw depth a so that axial freedom of the wiper element 6 in the claw 5 is ensured. However it must taken into consideration that as the wiper element 6 conforms to contoured windshields not only the claw height a alone is critical for the axial freedom of the wiper element 6 but also the claw opening dimension o, which can be seen from Figure 3, which is the sum of the distance of the tangent at the wiper element 6 at the point of contact A with the claw base 8 and the point of contact B of the wiper element 6 with the claw finger 10. According to the prior art, the rule is that the opening dimension c is always smaller than the claw height a.

To ensure optimal guidance and transmission of force by the wiper element 6 to the windshield, claw height a must not be much greater than the height x at the wiper element 6. However, the consequence of this is that the claw opening

dimension c in turn is only marginally greater than the wiper element height x, which permits only a modest curvature of the wiper element in a side view, and with a greater curvature results in the wiper element 6 jamming in the claw 5. If the claw height a is selected substantially greater than the wiper element height x to allow a more pronounced curvature of the wiper element, the wiper element 6 begins to float in the claw 5. The consequence of this is poor wiping of the glass.

In Figure 4 another claw from a known wiper blade is shown in which the problems described with Figure 3 are mitigated by the fact that the claw finger 10 is shorter than the claw base 8. But even with a layout of this type the potential curve in the wiper element 6 is limited by the claw height a.

The claw shown in Figure 5 from a wiper blade under the invention differs from the known prior art in that when projected onto the windshield the claw finger 10 is positioned closer to the pivot 15 of the claw bow 4 than the claw base 8. In this situation the distance d between the inner edge 11b of the contact surface 8a of the claw base 8 and the outer edge 12a of the claw finger is greater than or equal to zero.

Under the invention the opening dimension c of the claw 5 between the contact point A of the wiper element 6 in a curved state at the claw base 8 and the contact point B of the wiper element 6 in a curved state at the claw finger 10 is always greater than claw height a. As can be seen from Figure 5, the result is the right-angled triangle with the two legs a and d and the dimension c as the hypothenuse.

C is calculated as follows:

$$c = \sqrt{\quad d^2 + a^2}$$

Thus dimension c with d greater than zero is always greater than a. If the claw height a is configured even marginally greater than the height x of the part of the wiper element 6, or the rear body 6a, received by the claw 5, the wiper element 6 does not jam in the claw 5 because of the geometries described even in the case of the sharply curved wiper element 6 in the side view in Figure 5.

Since however the height x of the wiper element 6 is always has to be less than the claw height in order to ensure axial freedom of the wiper element 6 when the wiper element 6 is not curved, it especially holds true that this axial freedom in a curved state is always given since the claw opening dimension c (hypotenuse) is always greater than or equal to claw height a (leg) when the distance d (leg) is greater than or equal to zero. Therefore, jamming of the wiper element 6 in the claw 5, particularly even with steeply contoured windshields, is no longer possible under the invention.

The claw shown in Figure 6 from a wiper blade under the invention with a distance d greater than zero exhibits the special characteristic that the side of the claw base 8 facing the wiper element 6 and the side of the claw finger 10 facing the claw bow 4 have a convex curve. By means of a curvature of this type it is possible to achieve better conformance of the wiper element 6 to the claw 5, whereby better guidance and better axial freedom of the wiper element 6 in the claw 5 is ensured, which results in correspondingly good wipe performance.

Figures 7 and 8 show another embodiment of a claw 5 under the invention, where there is a different distance d1 or d2 respectively between the inner edge 11b of the bearing surface 8a on the claw base 8 and the outer edges 12a of the two claw fingers 13 and 14. In this case the wiper element 6 is not only bent in side view in order to conform to a contoured windshield but also curved in plan view, as shown in Figure 8. Wiper blades curved in this way in plan view are used primarily on vehicles for stylistic reasons, for example, to achieve a visual conformance to the adjacent curved side edge of the vehicle windshield. But even with wiper blades of this type it is necessary to guide the wiper element 6 as precisely as possible and to ensure good axial freedom.

As can be clearly seen in Figure 8, the distance d1 from the claw finger 13 on the side of the claw which is on the outside of the curvature of the wiper element is less than the distance d2 from the claw finger 14 on the other side of the claw, which is on the inside of the curvature of the wiper element. It is precisely because of a layout of this type that the wiper element 6, which is curved in a plan view and, when required, bent in a side view exhibits good axial freedom and does

not jam as the result of the positioning of the claw finger 13 and 14 in the curved and/or bent state.

Advantageously the claws shown in Figure 7 and 8 are also suitable when using wiper blades which are not curved in plan view and/or bent in a side view.

All the features presented in the description, the subsequent claims and the drawing can be essential to the invention, both individually as well as in any given combination.

What is claimed is:

What Is Claimed Is:

1. Wiper blade for cleaning a windshield, in particular, a curved windshield of a vehicle with a frame with at least two claws (5) to hold and guide a rubber-like wiper element (6), where the frame has at least one claw bow (4) with a claw (5) on at least one end of the bow and the claw bow (4) can be connected at a distance (D) from the claw (5) by means of a pivot (15) to a wiper arm (1) or is connected to an additional bow (2, 3) on the frame, where the claw (5) has at the claw base (8) a bearing surface (8a) which presses on the upper side of the wiper element (6) when the windshield wiper is operating, which surface is delimited in the longitudinal direction of the frame by an outer edge (11a) and an inner edge (11b) and has a maximum length (L), and where two claw sidewalls (9) which turn into claw fingers (10, 13, 14) extend from the claw base (8) toward the windshield to be wiped running along the opposite longitudinal sides of the wiper element (6) and where the claw fingers capture the rear body (6a) forming part of the wiper element (6) from below or engage longitudinal side grooves in the rear body (6), where the claw fingers (10, 13, 14) are bounded in the longitudinal direction of the bow are each/both delimited by an outer edge (12a) and an inner edge (12b), characterized in that the claw fingers (10) of at least one claw (5) on the windshield wiper (2) are offset in the longitudinal direction in relation to the contact surface (8a) toward the pivot (15) of the claw bow (4) in such a way that the outer edges (12a) of the claw feet (10) are located within an area which extends from inclusive of half of the maximum length (L) of the contact surface (8a) as far as the distance between the inner edge (11b) of the contact surface (8a) and the pivot (15) of the claw bow (4).

2. Wiper blade in accordance with claim 1, where between the inner edge (11b) of the contact surface (8a) and the outer edges (12a) of the claw fingers (10, 13, 14) a gap d is present with d equal to or less than zero.

3. Wiper blade in accordance with claim 1 or 2, where in a side view of the wiper blade the two claw fingers (10) are aligned with each other or where the distance d in the case of the two claw fingers (10) is the same.

4. Wiper blade in accordance with claim 1or 2, where the claw finger (13) is offset in the longitudinal direction in relation to the claw finger (14) or where the distance d1 of one claw finger (13) is different from the distance d2 of the other claw finger (14).

5. Wiper blade in accordance with claim 4, where the wiper element (6) is curved in plan view and where the distance d1 of one claw finger (13) on the side which lies on the outside of the wiper element curvature is less than the distance d2 on the other claw side (14) which lies on the inside of the wiper element curvature.

6. Wiper blade in accordance with claim 5, where the distances d1 and d2 are dependent on the degree of curvature of the wiper element (6) in plan view.

7. Wiper blade in accordance with one of the preceding claims, where the side of the claw base (8) facing the wiper element (6) is curved in relation to the claw fingers (10, 13, 14) and/or the claw fingers (10, 13, 14) have a convex curve in relation to the claw base (8).

8. Wiper blade in accordance with one of the preceding claims, where at least one claw (5) on the claw bow (4) is a windshield wiper end claw.

ABSTRACT

Abstract

A wiper blade for cleaning a windscreen, in particular a curved windscreen on a vehicle, is proposed having a frame with at least two claws (5) to retain and guide a rubber-like wiper element (6), where the frame has at least one claw bow (4) with a claw (5) on at least one end of the bow and a pivot (15) at a distance (D) from the claw (5), where the claw (5) has a contact surface (8a) at the claw base (8) pressing on the upper side of the wiper element (6), where said surface is delimited in the longitudinal direction of the bow by an outer edge (11a) and an inner edge (11b) and has a maximum length (L) and has claw fingers (10, 13, 14) on the opposite longitudinal sides of the wiper element (6) which capture the rear body (6a) forming part of the wiper element (6) or engage longitudinal grooves in the side of the rear body (6a) and are delimited in the longitudinal direction by an outer edge (12a) and an inner edge (12b), and said contact surface envisages that the claw fingers (10) of at least one claw (5) of the wiper blade (2) are offset in relation to the contact surface (8a) in the longitudinal direction of the bow toward the pivot (15) of the claw bow (4) in such a way that the outer edges (12a) of the claw fingers (10) are located within an area which extends from inclusive of half the maximum length (L) of the contact surface (8a) as far and into the distance between the inner edge (11b) of the contact surface (8a) and the pivot (15) of the claw bow (4).

(Fig. 5)

4 prts

SUBSTITUTE SPECIFICATION

Our File: WP 0007 (VWP-513-A) PATENT

WIPER BLADE FOR CLEANING A WINDSCREEN OF A VEHICLE

BACKGROUND

The invention relates to a wiper blade for cleaning a windshield, in particular, a curved windshield of a vehicle.

A wiper blade with a claw of this type has been known for a long time, from US 1,197,338, for example, and finds an application in almost every windshield wiper installation used today for cleaning a windshield on a vehicle. The wiper element of a wiper blade of this type is positioned in the claws with at least limited axial freedom so that the flexible wiper element is largely able to conform to the surface shape of the windshield to be wiped. The claws located on a claw bow serve to guide the wiper element along the windshield to be wiped and to transmit the requisite contact pressure to the wiper element, where the glass can also have a contoured shape. When designing claws, one consideration is that they guide the wiper element, or its rear body, as closely and precisely as possible. Nevertheless, the wiper element must have enough play in the claw to allow the wiper element some axial freedom in the claw.

Known wiper blades of this type however are under the disadvantage that they are poorly suited for use on at least partially contoured windshields.

The conflicting goal of ensuring close and precise guidance of the wiper element in the claw on the one hand and of permitting sufficient play in the claw for axial freedom of the wiper element on the other hand when wiping a contoured windshield cannot be met with known wiper blades. When claws for known windshield wipers are used for glass that is steeply contoured, particularly at the edges of the glass, the wiper element either jams because of its curvature or it floats because of excessive play in the claw so that optimal guiding of the wiper element is not ensured. The consequence is unsatisfactory wiping.

The object of the present invention is therefore to create a wiper blade with claws to locate a rubber-like wiper element at least partially, where the claws ensure good guidance and good axial freedom of the rubber-like wiper element in the claws even with a contoured or partially contoured windshield.

SUMMARY

To accomplish this object a wiper blade of the type described above is proposed in which the claw fingers of at least one claw on the wiper blade are offset toward the pivot of the bow in the longitudinal direction of the frame in relation to the contact surface in the claw base in such a way that the outer edges of the claw fingers are located within an area which extends from inclusive of the half of the maximum length of the contact surface as far as the distance between the inner edge of the contact surface and the pivot of the bow. In the sense of the invention, an outer edge of the contact surface in the claw base or an outer edge of a claw foot is always that edge which faces outward in the longitudinal direction of the frame. Correspondingly, an inner edge of the contact surface in the claw base or an inner edge of a claw finger is always that edge which faces inward in the longitudinal direction of the bow.

Alternatively this can be expressed in this way, that in the case of at least one claw on the windshield wiper, the claw fingers projected onto the windshield in relation to the contact surface projected onto the windshield are offset in such a way toward the pivot of the claw bow that the claw fingers projected onto the windshield are not overlapped by the bearing surface projected onto the windshield in the longitudinal direction of the claw bow, or at most by the half of the contact surface facing the pivot projected onto the windshield.

The claw designed under the invention can be used in a wide variety of frame or bow designs. So a claw bow configured according to the invention can, for example, be a primary bow pivotable directly at the wiper arm with a claw at each end, or a claw bow pivoted at a higher order bow with a claw at one end, or a bow with a claw at only one end and a claw bow at its other end. Similarly the frame for a windshield wiper can have two bows which are connected to each other at one of their ends by means of an articulated link and at least one of these bows has at its

other end a claw configured in accordance with the invention. The invention is intended further to include wiper blades with such frame or bow designs in which the claw or claws respectively are not located on the underside of the bow; but are located or configured, for example, laterally on or laterally from the bow.

Furthermore it should be made clear that wiper blades in accordance with the invention can be used for all possible types of glass, such as windshields, rear windows, side windows, (viewing windows in general), headlamp glass, rear lamp glass, backup lights and similar lights on different vehicles, specifically motor vehicles.

The wiper blade in accordance with the invention has the advantage that even with more steeply contoured windshields better conformance and guidance of the rubber-like wiper element to the glass to be wiped is ensured compared with known wiper blades. Jamming of the wiper element in the claw, as is regularly the case under the prior art in the case of steeply contoured glass, cannot happen under the invention.

Optimal design of the wiper blade is achieved from a further development of the invention, according to which a clearance d, with d equal to or greater than zero, is present between the inner edge of the contact surface provided on the claw base and the outer edges of the claw fingers.

The relevant cross section for the wiper element is calculated from the width b of the claw and the relevant opening dimension c of the claw for the part of the wiper element received by the claw. The opening dimension c is determined as the hypotenuse of the triangle with the legs as clearance d and claw depth a. From this it follows that when d is greater than or equal to zero, the opening dimension c is greater than or equal to claw depth a. Consequently, it is ensured that the relevant cross section of the claw for the part of the wiper element received by the claw is always greater than or equal to claw height a under the invention, particularly in the case of contoured glass. As a result of the necessary latitude of the wiper element in the claw, axial freedom of the wiper element is always possible and jamming of the wiper element does not occur, whereby correspondingly good results are achieved when wiping the glass.

In accordance with an advantageous embodiment of the invention, the two claw fingers should be aligned with one another in a side view of the wiper blade, or the distance d should be equal in the case of both claw fingers. This enables consistent guidance and transmission of force from the wiper element to the glass.

In an embodiment of the invention, one claw finger is positioned offset in the longitudinal direction of the bow in relation to the other claw finger, or the distance d1 of one claw finger is different from the distance d2 of the other claw finger. Asymmetry of this kind in the claw can be advantageous, particularly with corresponding windshield and/or wiper blade geometries.

A further development of the invention provides for the wiper element to be curved in plan view and for the distance d1 of the claw finger on the claw sidewall which is on the outside of the curvature of the wiper element to be smaller than the distance d2 on the other side of the claw which lies on the inside of the curvature of the wiper element. A further development of the invention of this type has the particular advantage that not only is optimal conformance of the wiper element to a sharply contoured glass ensured but also that when a wiper blade curved in plan view is used, the claw is configured in such a way that the wiper element is not impeded in its axial freedom by the claw. Wiper blades curved in plan view are used predominantly for stylistic and aesthetic reasons in motor vehicles.

According to another embodiment of the invention, the distances d1 and d2 are dependent on the degree of curvature of the wiper element when seen in plan view. With wiper elements which are only slightly curved, for example, the difference between the distances d1 and d2 is less than with especially sharply curved wiper elements. In this way optimal axial freedom of the wiper elements can be ensured even in the case of wiper elements that are curved in plan view.

One version of the invention envisions that the side of the claw base facing the wiper element with respect to the claw fingers and/or the claw fingers with respect to the claw base has or have a convex curve. Curvatures of this type make it possible to improve the axial freedom of the wiper element, particularly in the case of windshields with widely differing contours.

A further development of the invention provides for at least one claw on the claw bow to be an end claw for the wiper blade. An end claw is that claw on a wiper blade which is closest to the outer glass edge. Vehicle windshields are mostly more steeply contoured specifically in this area than in the center of the windshield. Consequently it makes sense to use claws in this particular area which ensure optimal guidance and transmission of force from the wiper element to the particularly steeply contoured sections of the windshield.

BRIEF DESCRIPTION OF THE DRAWING

In the drawings:

Figure 1 shows a wiper lever arm assembly for a windshield wiper device in side view;

Figure 2 shows a claw bow for a known wiper blade in side view;

Figures 3 and 4 show two different versions of a claw for a known wiper blade in side view;

Figures 5, 6 and 7 show three different claws, respectively, for a wiper blade according to the invention in side view; and

Figure 8 shows the claw shown in Figure 7 in plan view.

DETAILED DESCRIPTION

Figure 1 shows as an example a wiper lever arm 1 from a known windshield wiper installation for cleaning a windshield on a vehicle with a primary bow 2, on which two bows 3 are arranged symmetrically, which in turn are connected to claw bows 4. The claw bows 4 are mounted by means of the pivots 15 so that they can articulate with respect to the bows 3. At their opposite ends, the claw bows 4 each have a claw 5 on the side facing away from the primary bow 2. The claws 5 receive the rear body 6a forming part of a rubber-like wiper element 6, which can be specifically reinforced by spring splines, which are not shown, in longitudinal grooves in the rear body 6a.

Diverging from this type of windshield wiper, the main bow 2 could be configured directly as a claw bow as part of the invention by providing a claw at each of its opposite ends.

Figure 2 shows a claw bow 4 with a pivot 15 at a distance D from at least one of the claws 5, where two known claws 5 are located at the ends of the claw bow 4. These claws 5 receive the rear body 6a forming part of the wiper element 6, which has a wiping edge 7 on the side facing away from the claw bow 4.

Figure 3 shows a section of the claw bow 4 with the pivot 15 and with a claw 5 from a known wiper blade. The claw 5 has a claw base 8, two claw sidewalls 9 positioned on the claw base 8 which guide the longitudinal sides of the wiper element 6 or rear body 6a and claw fingers 10 which partially surround the wiper element 6 or rear body 6a. The claw fingers 10 are mainly parallel to the claw base 8. Between the claw base 8 and the claw finger 10 the height x is shown of that part of the wiper element 6 or of its rear body 6a which is received by the claw 5. The wiper element 6 or rear body 6a is shown slightly curved in the side view, specifically to conform to a contoured windshield which is not shown. The claw 5 has height a between the claw base 9 and the claw finger 10. The basic rule is that the depth x of the part of the windshield wiper blade 6 to be received by the claw 5 must be less than claw depth a so that axial freedom of the wiper element 6 in the claw 5 is ensured. However it must taken into consideration that as the wiper element 6 conforms to contoured windshields not only the claw height a alone is critical for the axial freedom of the wiper element 6 but also the claw opening dimension o, which can be seen from Figure 3, which is the sum of the distance of the tangent at the wiper element 6 at the point of contact A with the claw base 8 and the point of contact B of the wiper element 6 with the claw finger 10. According to the prior art, the rule is that the opening dimension c is always smaller than the claw height a.

To ensure optimal guidance and transmission of force by the wiper element 6 to the windshield, claw height a must not be much greater than the height x at the wiper element 6. However, the consequence of this is that the claw opening dimension c in turn is only marginally greater than the wiper element height x, which permits only a modest curvature of the wiper element in a side view, and with a greater curvature results in the wiper element 6 jamming in the claw 5. If the claw height a is selected substantially greater than the wiper element height x to allow a

more pronounced curvature of the wiper element, the wiper element 6 begins to float in the claw 5. The consequence of this is poor wiping of the glass.

In Figure 4 another claw from a known wiper blade is shown in which the problems described with Figure 3 are mitigated by the fact that the claw finger 10 is shorter than the claw base 8. But even with a layout of this type, the potential curve in the wiper element 6 is limited by the claw height a.

The claw shown in Figure 5 from a wiper blade under the invention differs from the known prior art in that when projected onto the windshield the claw finger 10 is positioned closer to the pivot 15 of the claw bow 4 than the claw base 8. In this situation the distance d between the inner edge 11b of the contact surface 8a of the claw base 8 and the outer edge 12a of the claw finger is greater than or equal to zero.

Under the invention, the opening dimension c of the claw 5 between the contact point A of the wiper element 6 in a curved state at the claw base 8 and the contact point B of the wiper element 6 in a curved state at the claw finger 10 is always greater than claw height a. As can be seen from Figure 5, the result is the right-angled triangle with the two legs a and d and the dimension c as the hypothenuse.

C is calculated as follows:

$$c = \sqrt{\quad d^2 + a^2}$$

Thus dimension c with d greater than zero is always greater than a. If the claw height a is configured even marginally greater than the height x of the part of the wiper element 6, or the rear body 6a, received by the claw 5, the wiper element 6 does not jam in the claw 5 because of the described geometries even in the case of the sharply curved wiper element 6 in the side view in Figure 5.

Since however the height x of the wiper element 6 is always has to be less than the claw height in order to ensure axial freedom of the wiper element 6 when the wiper element 6 is not curved, it especially holds true that this axial freedom in a curved state is always given since the claw opening dimension c

(hypotenuse) is always greater than or equal to claw height a (leg) when the distance d (leg) is greater than or equal to zero. Therefore, jamming of the wiper element 6 in the claw 5, particularly even with steeply contoured windshields, is no longer possible under the invention.

The claw shown in Figure 6 from a wiper blade under the invention with a distance d greater than zero exhibits the special characteristic that the side of the claw base 8 facing the wiper element 6 and the side of the claw finger 10 facing the claw bow 4 have a convex curve. By means of a curvature of this type it is possible to achieve better conformance of the wiper element 6 to the claw 5, whereby better guidance and better axial freedom of the wiper element 6 in the claw 5 is ensured, which results in correspondingly good wipe performance.

Figures 7 and 8 show another embodiment of a claw 5 under the invention, where there is a different distance d1 or d2 respectively between the inner edge 11b of the bearing surface 8a on the claw base 8 and the outer edges 12a of the two claw fingers 13 and 14. In this case, the wiper element 6 is not only bent in side view in order to conform to a contoured windshield but also curved in plan view, as shown in Figure 8. Wiper blades curved in this way in plan view are used primarily on vehicles for stylistic reasons, for example, to achieve a visual conformance to the adjacent curved side edge of the vehicle windshield. But even with wiper blades of this type it is necessary to guide the wiper element 6 as precisely as possible and to ensure good axial freedom.

As can be clearly seen in Figure 8, the distance d1 from the claw finger 13 on the side of the claw which is on the outside of the curvature of the wiper element is less than the distance d2 from the claw finger 14 on the other side of the claw, which is on the inside of the curvature of the wiper element. It is precisely because of a layout of this type that the wiper element 6, which is curved in a plan view and, when required, bent in a side view exhibits good axial freedom and does not jam as the result of the positioning of the claw finger 13 and 14 in the curved and/or bent state.

Advantageously the claws shown in Figure 7 and 8 are also suitable when using wiper blades which are not curved in plan view and/or bent in a side view.

All the features presented in the description, the subsequent claims and the drawing can be essential to the invention, both individually as well as in any given combination.

What Is Claimed Is:

1. Wiper blade for cleaning a windshield, in particular, a curved windshield of a vehicle with a frame with at least two claws (5) to hold and guide a rubber-like wiper element (6), where the frame has at least one claw bow (4) with a claw (5) on at least one end of the bow and the claw bow (4) can be connected at a distance (D) from the claw (5) by means of a pivot (15) to a wiper arm (1) or is connected to an additional bow (2, 3) on the frame, where the claw (5) has at the claw base (8) a bearing surface (8a) which presses on the upper side of the wiper element (6) when the windshield wiper is operating, which surface is delimited in the longitudinal direction of the frame by an outer edge (11a) and an inner edge (11b) and has a maximum length (L), and where two claw sidewalls (9) which turn into claw fingers (10, 13, 14) extend from the claw base (8) toward the windshield to be wiped running along the opposite longitudinal sides of the wiper element (6) and where the claw fingers capture the rear body (6a) forming part of the wiper element (6) from below or engage longitudinal side grooves in the rear body (6), where the claw fingers (10, 13, 14) are bounded in the longitudinal direction of the bow are each/both delimited by an outer edge (12a) and an inner edge (12b), characterized in that the claw fingers (10) of at least one claw (5) on the windshield wiper (2) are offset in the longitudinal direction in relation to the contact surface (8a) toward the pivot (15) of the claw bow (4) in such a way that the outer edges (12a) of the claw feet (10) are located within an area which extends from inclusive of half of the maximum length (L) of the contact surface (8a) as far as the distance between the inner edge (11b) of the contact surface (8a) and the pivot (15) of the claw bow (4).

2. Wiper blade in accordance with claim 1, where between the inner edge (11b) of the contact surface (8a) and the outer edges (12a) of the claw fingers (10, 13, 14) a gap d is present with d equal to or less than zero.

3. Wiper blade in accordance with claim 1 or 2, where in a side view of the wiper blade the two claw fingers (10) are aligned with each other or where the distance d in the case of the two claw fingers (10) is the same.

4. Wiper blade in accordance with claim 1or 2, where the claw finger (13) is offset in the longitudinal direction in relation to the claw finger (14) or where the distance d1 of one claw finger (13) is different from the distance d2 of the other claw finger (14).

5. Wiper blade in accordance with claim 4, where the wiper element (6) is curved in plan view and where the distance d1 of one claw finger (13) on the side which lies on the outside of the wiper element curvature is less than the distance d2 on the other claw side (14) which lies on the inside of the wiper element curvature.

6. Wiper blade in accordance with claim 5, where the distances d1 and d2 are dependent on the degree of curvature of the wiper element (6) in plan view.

7. Wiper blade in accordance with one of the preceding claims, where the side of the claw base (8) facing the wiper element (6) is curved in relation to the claw fingers (10, 13, 14) and/or the claw fingers (10, 13, 14) have a convex curve in relation to the claw base (8).

8. Wiper blade in accordance with one of the preceding claims, where at least one claw (5) on the claw bow (4) is a windshield wiper end claw.

4/prts

Wiper Blade For Cleaning A Windscreen, In Particular, A Curved Windscreen Of A Vehicle

The invention relates to a wiper blade for cleaning a windshield, in particular a curved windshield of a vehicle with a frame with at least two claws to retain and guide a rubber-like wiper element, where the frame has a least one claw bow with a claw on least one end of the bow and the claw bow can be connected by means of a pivot to a wiper arm at a distance from the claw or is connected to an additional bow on the frame, where the claw has a contact surface at the base of the claw pressing on the upper side of the wiper element when the windshield wiper is operating, and the contact surface is delimited in the longitudinal direction of the frame by an outer edge and an inner edge and has a maximum length, and where two claw sidewalls running along the opposite longitudinal sides of the wiper element extend from the claw base toward the glass to be wiped, which claw sidewalls turn into claw fingers which capture the rear body forming part of the wiper element at the base or engage longitudinal side grooves in the rear body, where the claw fingers are delimited in the longitudinal direction of the frame in each case by an outer edge and an inner edge.

A wiper blade with a claw of this type has been known for a long time, from US 1,197,338, for example, and finds an application in almost every windshield wiper installation used today for cleaning a windshield on a vehicle. The wiper element of a wiper blade of this type is positioned in the claws with at least limited axial freedom so that the flexible wiper element is largely able to conform to the surface shape of the windshield to be wiped. The claws located on a claw bow serve to guide the wiper element along the windshield to be wiped and to transmit the requisite contact pressure to the wiper element, where the glass can also have a contoured shape. When designing claws one consideration is that they guide the wiper element, or its rear body, as closely and precisely as possible. Nevertheless, the wiper element must have enough play in the claw to allow the wiper element some axial freedom in the claw.

Known wiper blades of this type however are under the disadvantage that they are poorly suited for use on at least partially contoured windshields.

The conflicting goal of ensuring close and precise guidance of the wiper element in the claw on the one hand and of permitting sufficient play in the claw for axial freedom of the wiper element on the other hand when wiping a contoured windshield cannot be met with known wiper blades. When claws for known windshield wipers are used for glass that is steeply contoured, particularly at the edges of the glass, the wiper element either jams because of its curvature or it floats because of excessive play in the claw so that optimal guiding of the wiper element is not ensured. The consequence is unsatisfactory wiping.

The object of the present invention is therefore to create a wiper blade with claws to locate a rubber-like wiper element at least partially, where the claws ensure good guidance and good axial freedom of the rubber-like wiper element in the claws even with a contoured or partially contoured windshield.

To accomplish this object a wiper blade of the type described at the beginning is proposed in which the claw fingers of at least one claw on the wiper blade are offset toward the pivot of the bow in the longitudinal direction of the frame in relation to the contact surface in the claw base in such a way that the outer edges of the claw fingers are located within an area which extends from inclusive of the half of the maximum length of the contact surface as far as the distance between the inner edge of the contact surface and the pivot of the bow. In the sense of the invention an outer edge of the contact surface in the claw base or an outer edge of a claw foot is always that edge which faces outward in the longitudinal direction of the frame. Correspondingly, an inner edge of the contact surface in the claw base or an inner edge of a claw finger is always that edge which faces inward in the longitudinal direction of the bow.

Alternatively this [state of affairs] / can be expressed in this way, that in the case of at least one claw on the windshield wiper the claw fingers projected onto the windshield in relation to the contact surface projected onto the windshield are offset in such a way toward the pivot of the claw bow that the claw fingers projected onto the windshield are not overlapped by the bearing surface projected

onto the windshield in the longitudinal direction of the claw bow, or at most by the half of the contact surface facing the pivot projected onto the windshield.

The claw designed under the invention can be used in a wide variety of frame or bow designs. So a claw bow configured according to the invention can, for example, be a primary bow pivotable directly at the wiper arm with a claw at each end, or a claw bow pivoted at a higher order bow with a claw at one end of each, or a bow with a claw at only one end and a claw bow at its other end. Similarly the frame for a windshield wiper can have two bows which are connected to each other at one of their ends by means of a an articulated link and at least one of these bows has at its other end a claw configured in accordance with the invention. The invention is intended further to include wiper blades with such frame or bow designs in which the claw or claws respectively are not located on the underside of the bow but located or configured, for example, laterally on or laterally from the bow.

Furthermore it should be made clear that wiper blades in accordance with the invention can be used for all possible types of glass, such as windshields, rear windows, side windows, (viewing windows in general), headlamp glass, rear lamp glass, backup lights and similar on different vehicles, specifically motor vehicles.

The wiper blade in accordance with the invention has the advantage that even with more steeply contoured windshields better conformance and guidance of the rubber-like wiper element to the glass to be wiped is ensured compared with known wiper blades. Jamming of the wiper element in the claw, as is regularly the case under the prior art in the case of steeply contoured glass, cannot happen under the invention.

Optimal design of the wiper blade is achieved from a further development of the invention, according to which a clearance d, with d equal to or greater than zero, is present between the inner edge of the contact surface provided on the claw base and the outer edges of the claw fingers.

The relevant cross section for the wiper element is calculated from the width b of the claw and the relevant opening dimension c of the claw for the part of the wiper element received by the claw. The opening dimension c is determined as

the hypotenuse of the triangle with the legs as clearance d and claw depth a. From this it follows that when d is greater than or equal to zero, the opening dimension c is greater than or equal to claw depth a. Consequently, it is ensured that the relevant cross section of the claw for the part of the wiper element received by the claw is always greater than or equal to claw height a under the invention, particularly in the case of contoured glass. As a result of the necessary latitude of the wiper element in the claw, axial freedom of the wiper element is always possible and jamming of the wiper element does not occur, whereby correspondingly good results are achieved when wiping the glass.

In accordance with an advantageous embodiment of the invention the two claw fingers should be aligned with one another in a side view of the wiper blade, or the distance d should be equal in the case of both claw fingers. This enables consistent guidance and transmission of force from the wiper element to the glass.

In [an?] embodiment of the invention one claw finger is positioned offset in the longitudinal direction of the bow in relation to the other claw finger, or the distance d1 of one claw finger is different from the distance d2 of the other claw finger. Asymmetry of this kind in the claw can be advantageous, particularly with corresponding windshield and/or wiper blade geometries.

A further development of the invention provides for the wiper element to be curved in plan view and for the distance d1 of the claw finger on the claw sidewall which is on the outside of the curvature of the wiper element to be smaller than the distance d2 on the other side of the claw which lies on the inside of the curvature of the wiper element. A further development of the invention of this type has the particular advantage that not only is optimal conformance of the wiper element to a sharply contoured glass ensured but also that when a wiper blade curved in plan view is used, the claw is configured in such a way that the wiper element is not impeded in its axial freedom by the claw. Wiper blades curved in plan view are used predominantly for stylistic and aesthetic reasons in motor vehicles.

According to another embodiment of the invention the distances d1 and d2 are dependent on the degree of curvature of the wiper element when seen in plan view. With wiper elements which are only slightly curved, for example, the

difference between the distances d1 and d2 is less than with especially sharply curved wiper elements. In this way optimal axial freedom of the wiper elements can be ensured even in the case of wiper elements that are curved in plan view.

One version of the invention envisions that the side of the claw base facing the wiper element with respect to the claw fingers and/or the claw fingers with respect to the claw base has or have a convex curve. Curvatures of this type make it possible to improve the axial freedom of the wiper element, particularly in the case of windshields with widely differing contours.

A further development of the invention provides for at least one claw on the claw bow to be an end claw for the wiper blade. An end claw is that claw on a wiper blade which is closest to the outer glass edge. Vehicle windshields are mostly more steeply contoured specifically in this area than in the center of the windshield. Consequently it makes sense to use claws in this particular area which ensure optimal guidance and transmission of force from the wiper element to the particularly steeply contoured sections of the windshield.

Figure 1 shows: a wiper lever arm assembly for a windshield wiper device in side view,

Figure 2 shows: a claw bow for a known wiper blade in side view,

Figures 3 and 4 show: two different versions of a claw for a known wiper blade in side view

Figures 5, 6 and 7 show: three different claws for a wiper blade according to the invention in side view and

Figure 8 shows: the claw shown in Figure 7 in plan view.

Figure 1 shows as an example a wiper lever arm 1 from a known windshield wiper installation for cleaning a windshield on a vehicle with a primary bow 2, on which two bows 3 are arranged symmetrically, which in turn are connected to claw bows 4. The claw bows 4 are mounted by means of the pivots 15 so that they can articulate with respect to the bows 3. At their opposite ends the claw bows 4 each have a claw 5 on the side facing away from the primary bow 2. The claws 5 receive the rear body 6a forming part of a rubber-like wiper element 6, which can be

specifically reinforced by spring splines, which are not shown, in longitudinal grooves in the rear body 6a.

Diverging from this type of windshield wiper, the main bow 2 could be configured directly as a claw bow as part of the invention by providing a claw at each of its opposite ends.

Figure 2 shows a claw bow 4 with a pivot 15 at a distance D from at least one of the claws 5, where two known claws 5 are located at the ends of the claw bow 4. These claws 5 receive the rear body 6a forming part of the wiper element 6, which has a wiping edge 7 on the side facing away from the claw bow 4.

Figure 3 shows a section of the claw bow 4 with the pivot 15 and with a claw 5 from a known wiper blade. The claw 5 has a claw base 8, two claw sidewalls 9 positioned on the claw base 8 which guide the longitudinal sides of the wiper element 6 or rear body 6a and claw fingers 10 which partially surround the wiper element 6 or rear body 6a. The claw fingers 10 are mainly parallel to the claw base 8. Between the claw base 8 and the claw finger 10 the height x is shown of that part of the wiper element 6 or of its rear body 6a which is received by the claw 5. The wiper element 6 or rear body 6a is shown slightly curved in the side view, specifically to conform to a contoured windshield which is not shown. The claw 5 has height a between the claw base 9 and the claw finger 10. The basic rule is that the depth x of the part of the windshield wiper blade 6 to be received by the claw 5 must be less than claw depth a so that axial freedom of the wiper element 6 in the claw 5 is ensured. However it must taken into consideration that as the wiper element 6 conforms to contoured windshields not only the claw height a alone is critical for the axial freedom of the wiper element 6 but also the claw opening dimension o, which can be seen from Figure 3, which is the sum of the distance of the tangent at the wiper element 6 at the point of contact A with the claw base 8 and the point of contact B of the wiper element 6 with the claw finger 10. According to the prior art, the rule is that the opening dimension c is always smaller than the claw height a.

To ensure optimal guidance and transmission of force by the wiper element 6 to the windshield, claw height a must not be much greater than the height x at the wiper element 6. However, the consequence of this is that the claw opening

dimension c in turn is only marginally greater than the wiper element height x, which permits only a modest curvature of the wiper element in a side view, and with a greater curvature results in the wiper element 6 jamming in the claw 5. If the claw height a is selected substantially greater than the wiper element height x to allow a more pronounced curvature of the wiper element, the wiper element 6 begins to float in the claw 5. The consequence of this is poor wiping of the glass.

In Figure 4 another claw from a known wiper blade is shown in which the problems described with Figure 3 are mitigated by the fact that the claw finger 10 is shorter than the claw base 8. But even with a layout of this type the potential curve in the wiper element 6 is limited by the claw height a.

The claw shown in Figure 5 from a wiper blade under the invention differs from the known prior art in that when projected onto the windshield the claw finger 10 is positioned closer to the pivot 15 of the claw bow 4 than the claw base 8. In this situation the distance d between the inner edge 11b of the contact surface 8a of the claw base 8 and the outer edge 12a of the claw finger is greater than or equal to zero.

Under the invention the opening dimension c of the claw 5 between the contact point A of the wiper element 6 in a curved state at the claw base 8 and the contact point B of the wiper element 6 in a curved state at the claw finger 10 is always greater than claw height a. As can be seen from Figure 5, the result is the right-angled triangle with the two legs a and d and the dimension c as the hypothenuse.

C is calculated as follows:

$$c = \sqrt{\quad d^2 + a^2}$$

Thus dimension c with d greater than zero is always greater than a. If the claw height a is configured even marginally greater than the height x of the part of the wiper element 6, or the rear body 6a, received by the claw 5, the wiper element 6 does not jam in the claw 5 because of the geometries described even in the case of the sharply curved wiper element 6 in the side view in Figure 5.

Since however the height x of the wiper element 6 is always has to be less than the claw height in order to ensure axial freedom of the wiper element 6 when the wiper element 6 is not curved, it especially holds true that this axial freedom in a curved state is always given since the claw opening dimension c (hypotenuse) is always greater than or equal to claw height a (leg) when the distance d (leg) is greater than or equal to zero. Therefore, jamming of the wiper element 6 in the claw 5, particularly even with steeply contoured windshields, is no longer possible under the invention.

The claw shown in Figure 6 from a wiper blade under the invention with a distance d greater than zero exhibits the special characteristic that the side of the claw base 8 facing the wiper element 6 and the side of the claw finger 10 facing the claw bow 4 have a convex curve. By means of a curvature of this type it is possible to achieve better conformance of the wiper element 6 to the claw 5, whereby better guidance and better axial freedom of the wiper element 6 in the claw 5 is ensured, which results in correspondingly good wipe performance.

Figures 7 and 8 show another embodiment of a claw 5 under the invention, where there is a different distance d1 or d2 respectively between the inner edge 11b of the bearing surface 8a on the claw base 8 and the outer edges 12a of the two claw fingers 13 and 14. In this case the wiper element 6 is not only bent in side view in order to conform to a contoured windshield but also curved in plan view, as shown in Figure 8. Wiper blades curved in this way in plan view are used primarily on vehicles for stylistic reasons, for example, to achieve a visual conformance to the adjacent curved side edge of the vehicle windshield. But even with wiper blades of this type it is necessary to guide the wiper element 6 as precisely as possible and to ensure good axial freedom.

As can be clearly seen in Figure 8, the distance d1 from the claw finger 13 on the side of the claw which is on the outside of the curvature of the wiper element is less than the distance d2 from the claw finger 14 on the other side of the claw, which is on the inside of the curvature of the wiper element. It is precisely because of a layout of this type that the wiper element 6, which is curved in a plan view and, when required, bent in a side view exhibits good axial freedom and does

not jam as the result of the positioning of the claw finger 13 and 14 in the curved and/or bent state.

Advantageously the claws shown in Figure 7 and 8 are also suitable when using wiper blades which are not curved in plan view and/or bent in a side view.

All the features presented in the description, the subsequent claims and the drawing can be essential to the invention, both individually as well as in any given combination.

What Is Claimed Is:

1. Wiper blade for cleaning a windshield, in particular, a curved windshield of a vehicle with a frame with at least two claws (5) to hold and guide a rubber-like wiper element (6), where the frame has at least one claw bow (4) with a claw (5) on at least one end of the bow and the claw bow (4) can be connected at a distance (D) from the claw (5) by means of a pivot (15) to a wiper arm (1) or is connected to an additional bow (2, 3) on the frame, where the claw (5) has at the claw base (8) a bearing surface (8a) which presses on the upper side of the wiper element (6) when the windshield wiper is operating, which surface is delimited in the longitudinal direction of the frame by an outer edge (11a) and an inner edge (11b) and has a maximum length (L), and where two claw sidewalls (9) which turn into claw fingers (10, 13, 14) extend from the claw base (8) toward the windshield to be wiped running along the opposite longitudinal sides of the wiper element (6) and where the claw fingers capture the rear body (6a) forming part of the wiper element (6) from below or engage longitudinal side grooves in the rear body (6), where the claw fingers (10, 13, 14) are bounded in the longitudinal direction of the bow are each/both delimited by an outer edge (12a) and an inner edge (12b), characterized in that the claw fingers (10) of at least one claw (5) on the windshield wiper (2) are offset in the longitudinal direction in relation to the contact surface (8a) toward the pivot (15) of the claw bow (4) in such a way that the outer edges (12a) of the claw feet (10) are located within an area which extends from inclusive of half of the maximum length (L) of the contact surface (8a) as far as the distance between the inner edge (11b) of the contact surface (8a) and the pivot (15) of the claw bow (4).

2. Wiper blade in accordance with claim 1, where between the inner edge (11b) of the contact surface (8a) and the outer edges (12a) of the claw fingers (10, 13, 14) a gap d is present with d equal to or less than zero.

3. Wiper blade in accordance with claim 1 or 2, where in a side view of the wiper blade the two claw fingers (10) are aligned with each other or where the distance d in the case of the two claw fingers (10) is the same.

4. Wiper blade in accordance with claim 1or 2, where the claw finger (13) is offset in the longitudinal direction in relation to the claw finger (14) or where the distance d1 of one claw finger (13) is different from the distance d2 of the other claw finger (14).

5. Wiper blade in accordance with claim 4, where the wiper element (6) is curved in plan view and where the distance d1 of one claw finger (13) on the side which lies on the outside of the wiper element curvature is less than the distance d2 on the other claw side (14) which lies on the inside of the wiper element curvature.

6. Wiper blade in accordance with claim 5, where the distances d1 and d2 are dependent on the degree of curvature of the wiper element (6) in plan view.

7. Wiper blade in accordance with one of the preceding claims, where the side of the claw base (8) facing the wiper element (6) is curved in relation to the claw fingers (10, 13, 14) and/or the claw fingers (10, 13, 14) have a convex curve in relation to the claw base (8).

8. Wiper blade in accordance with one of the preceding claims, where at least one claw (5) on the claw bow (4) is a windshield wiper end claw.

Abstract

A wiper blade for cleaning a windscreen, in particular a curved windscreen on a vehicle, is proposed having a frame with at least two claws (5) to retain and guide a rubber-like wiper element (6), where the frame has at least one claw bow (4) with a claw (5) on at least one end of the bow and a pivot (15) at a distance (D) from the claw (5), where the claw (5) has a contact surface (8a) at the claw base (8) pressing on the upper side of the wiper element (6), where said surface is delimited in the longitudinal direction of the bow by an outer edge (11a) and an inner edge (11b) and has a maximum length (L) and has claw fingers (10, 13, 14) on the opposite longitudinal sides of the wiper element (6) which capture the rear body (6a) forming part of the wiper element (6) or engage longitudinal grooves in the side of the rear body (6a) and are delimited in the longitudinal direction by an outer edge (12a) and an inner edge (12b), and said contact surface envisages that the claw fingers (10) of at least one claw (5) of the wiper blade (2) are offset in relation to the contact surface (8a) in the longitudinal direction of the bow toward the pivot (15) of the claw bow (4) in such a way that the outer edges (12a) of the claw fingers (10) are located within an area which extends from inclusive of half the maximum length (L) of the contact surface (8a) as far and into the distance between the inner edge (11b) of the contact surface (8a) and the pivot (15) of the claw bow (4).

(Fig. 5)

Fig. 1

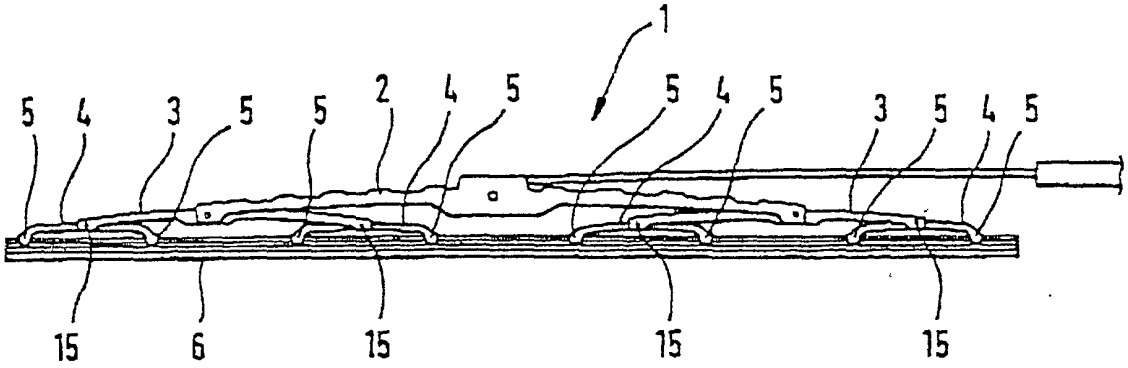


Fig. 2

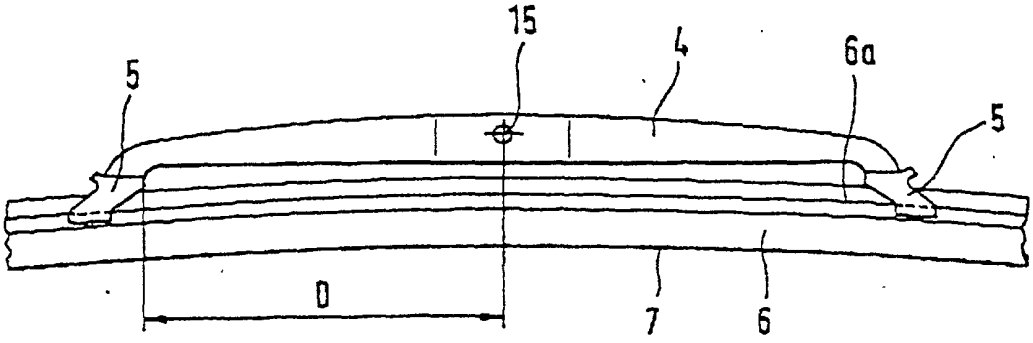
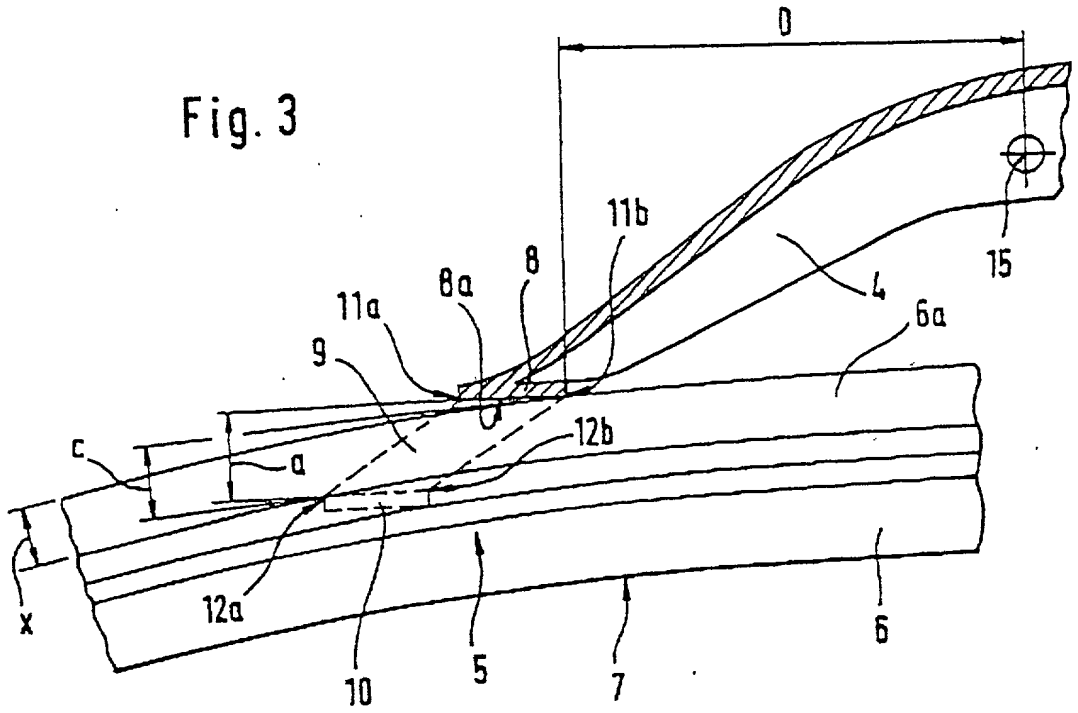


Fig. 3



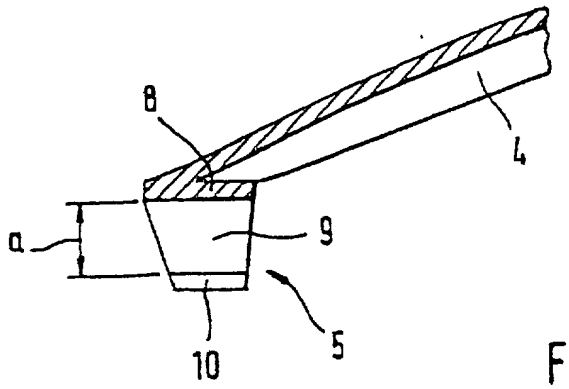


Fig. 4

Fig. 5

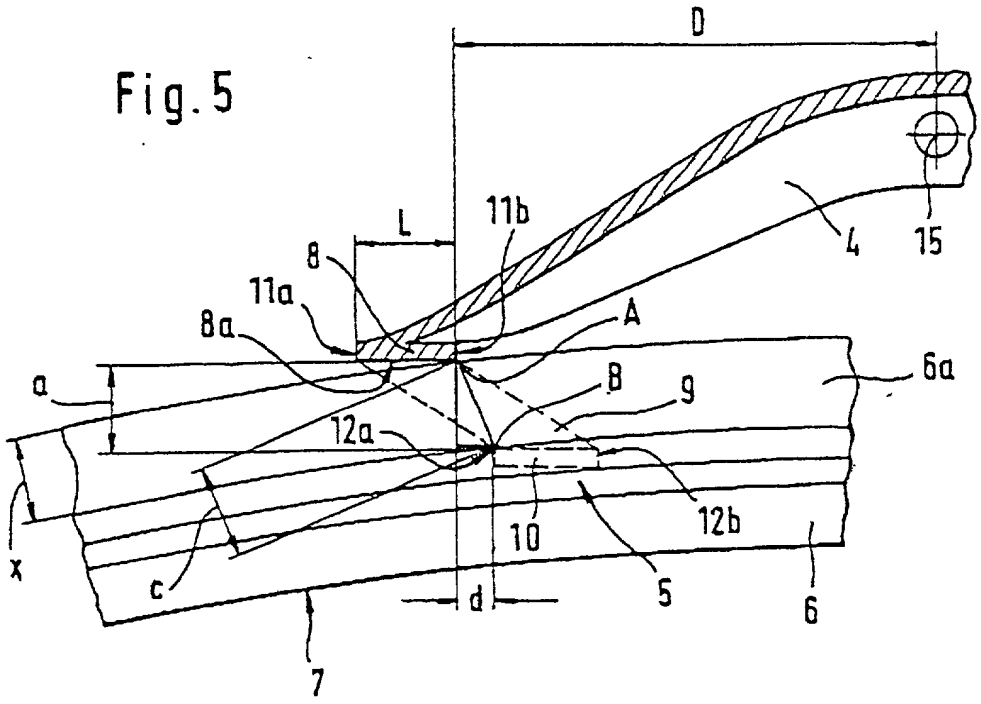


Fig. 6

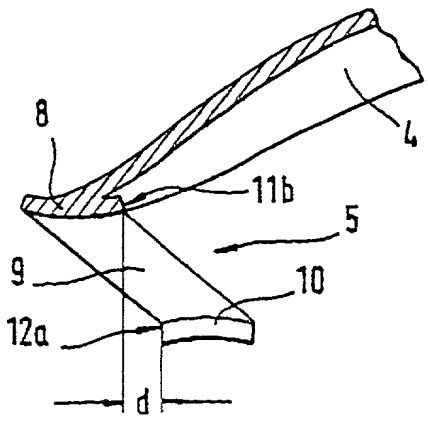
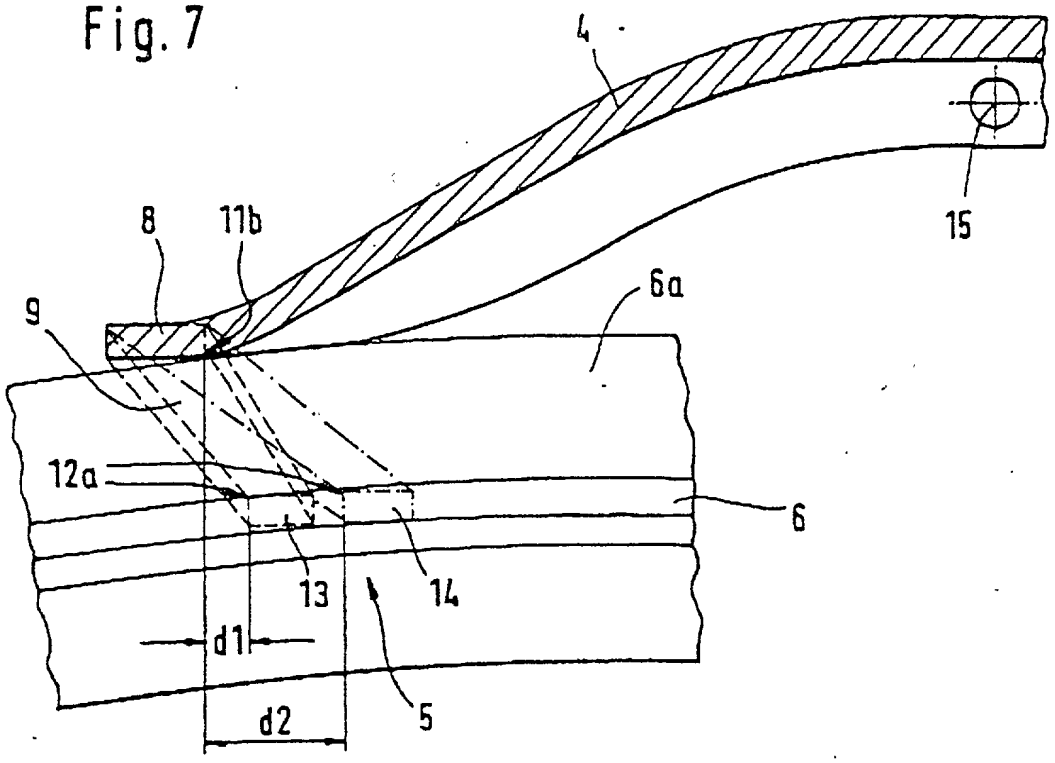


Fig. 7



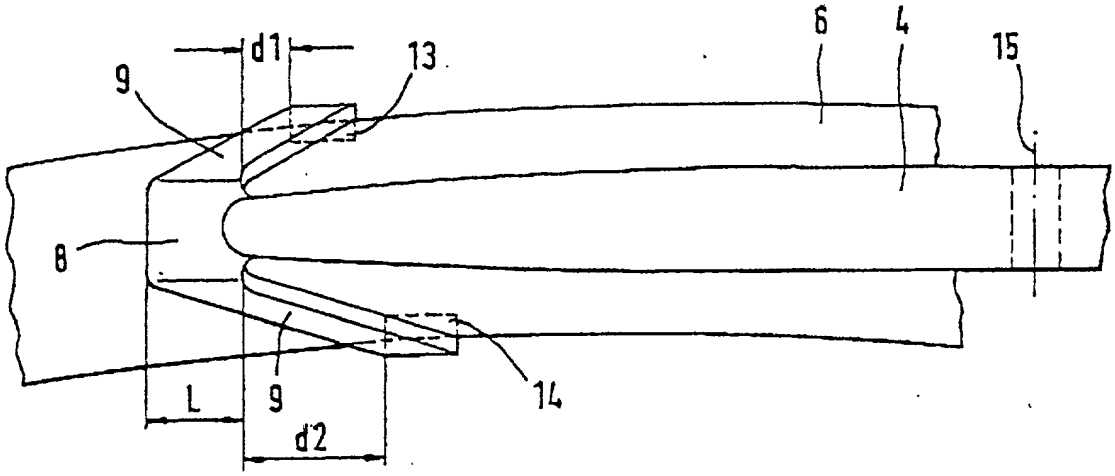


Fig. 8

Our Reference: WP0007 (VWP-513-A)

COMBINED DECLARATION AND POWER OF ATTORNEY

DECLARATION:

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

WIPER BLADE FOR CLEANING A WINDSCREEN OF A VEHICLE

the specification of which (check only one item below):

[ ] is attached hereto.

[ ] was filed as United States application Serial No. ______________ on __________, and was amended on or through ______________(if applicable).

[X] was filed as PCT international application Number PCT/EP00/07620 on August 5, 2000, and was amended under PCT Article 19 on ___________(if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate or §365(a) of any PCT international application(s) which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT international application(s) having a filing date before that of the application on which priority is claimed:

Prior Foreign/PCT Application(s) and any Priority Claims Under 35 U.S.C. §119: Priority Claimed

(Number)	(Country)	(Day/Mo/Yr Filed)	Yes	No
199 40 492.5	Germany	26 August 1999	[X]	[ ]
			[ ]	[ ]

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below.

(Application Number)	(Filing Date)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or §365(c) of any PCT international application(s) designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

Prior U. S. Application(s) or PCT International Application(s) Designating the U.S. for Benefit Under 35 U.S.C. §120:

(Application Number)	(Filing Date)	(Status: patented, pending, abandoned)

(4)

POWER OF ATTORNEY:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

1-00

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